Claims

1. a multiphase electric motor comprising:

a rotor;

a stator assembly having a predetermined number of stator core components and electrically energizable core windings associated therewith;

a sensible system rotatable in correspondence with the rotation of said rotor, having a reference phase region with a unique reference sensing attribute defining a reference phase and transition regions having a phase commuting attribute corresponding with the transition to each phase in a commutation sequence of phases;

a sensor having a single output with a first output characteristic in the presence of said unique reference sensing attribute and a second output characteristic in correspondence with said phase commutating attribute; and

a control circuit having an output coupled to effect energization of said core windings, responsive when energized to said sensor first output characteristic to effect excitation of said core windings defining said reference phase and responsive to each said second output characteristic to effect excitation of said core windings defining successive phases in said commutation sequence of phases.

2. The electric motor of claim 1 in which:

said sensible system reference phase region occurs within each 360° of electrical rotation effected by said control circuit.

3. The electric motor of claim 1 in which:

said sensible system reference phase region occurs within each 360° of said rotor rotation.

4. The electric motor of claim 1 in which:

said sensible system phase commutating attribute corresponds with the commencement of each phase in the commutation sequence.

5. The electric motor of claim 1 in which:

said control circuit, when initially energized, carries out the energization of a predetermined number of said core windings for an interval effective for the rotation of said rotor toward a magnetically stable orientation.

6. The electric motor of claim 1 in which:

said sensor is a Hall effect device; and

said sensible system comprises a magnetic region of first rotor rotation angular extent and first magnetic polarity defining a said reference phase region, and a magnetic region of second rotor rotation angular extent and said first magnetic polarity defining a said transition region having said phase commutating attribute.

7. The electric motor of claim 6 in which:

said first rotor rotation angular extent is greater than said second rotor rotation angular extent an amount effective to derive an assured identification of said reference phase.

8. The electric motor of claim 1 in which:

said control circuit comprises a binary logic device having phase defining outputs, at least three commutation switches in phase defining operational association with said core windings, and an array of logic gates having inputs coupled with said binary logic device to receive said phase defining outputs and having gate outputs coupled with said commutation switches.

9. The electric motor of claim 8 in which:

said binary logic device is responsive to said sensor first output characteristic in the presence of said unique reference sensing attribute to enter a reset condition exhibiting phase defining outputs establishing said reference phase.

10. The electric motor of claim 1 in which:

said sensible system is comprised of optically passing and blocking regions and said sensor is an optical detector.

11. The electric motor of claim 1 in which:

said sensible system is comprised of optical reflective and non-reflective regions and said sensor is an optical detector.

12. A method for commutating an electronically commutated multiphase electric motor having a rotor rotatable about a motor axis and a stator assembly configured with stator windings defining phases, comprising the steps of:

(a) providing a sensible system rotatable in correspondence with the rotation of said rotor and having phase commutating information defining sensible transitions at the commencement of each of said phases as they occur in commutational succession;

(b) providing a single sensor operatively associated with said sensible system, having a sensor output altering between sensor states in response to said sensible system transitions ;

(c) identifying a starting phase for energizing said stator windings to cause said rotor to rotate about said motor axis in a given direction;

(d) commencing the operation of said motor by energizing those said stator windings establishng an aligning phase occurring prior to said identified starting phase in said commutational succession to an extent effective to cause said rotor to rotate toward a magnetically stable position exhibiting substantially zero torque;

(e) then de-energizing said stator windings representing said aligning phase and energizing said stator windings representing said starting phase; and

(f) energizing only those said stator windings representing a next phase in said commutational succession in response to said sensor output.

13. The method of claim 12 in which:

said step (a) sensible system phase commutating information is provided as magnetic regions of first and second magnetic polarity; and

said step (b) provides said sensor as a Hall effect device.

14. The method of claim 13 in which:

said step (a) provides said regions of first and second magnetic polarity in integral form with said rotor regions of alternating polarity.

15. The method of claim 13 in which:

said step (a) provides said regions of first and second magnetic polarity as a slave magnet assembly drivably rotatable in correspondence with the rotation of said rotor.

16. The method of claim 12 in which:

said step (b) provides said sensor as an optical detector; and

said step (a) sensible system phase commutating information is provided as optically detectable transitions.

17. A method for commutating a multiphase electronically commutated electric motor having a rotor rotatable about a motor axis and a stator assembly configured with energizable stator windings, comprising the steps of:

providing a sensible system rotatable in correspondence with the rotation of said rotor and having a reference sensing attribute defining a reference phase and a phase commutating attribute corresponding with the commencement of each phase in a commutation sequence of phases;

providing a sensor having an output with a first attribute in the presence of said sensible system reference sensing attribute and having a second attribute in correspondence with said phase commutating attribute;

mandatorily energizing those said stator windings representing said reference phase in the presence of said output with said first attribute; and

de-energizing those said stator windings representing said reference phase upon the occurrence of said output having said second attribute in the absence of said first attribute and then successively energizing those said stator windings representing subsequent phases in said commutation sequences.

18. The method of claim 17 in which:

said step for providing a sensible system provides said reference sensing attribute once within each 360° of electrical rotation of said rotor.

19. The method of claim 17 in which:

said step for providing a sensible system provides said reference sensing attribute once within each 360° of rotation of said rotor.

20. The method of claim 17 in which:

said step for providing a sensor provides said sensor as a Hall effect device; and

said step for providing a sensible system provides said reference sensing attribute as a magnetic region corresponding with a first rotor rotational extent and of first magnetic polarity.

21. The method of claim 17 in which:

said step for providing a sensor provides said sensor as an optical sensor; and said step for providing a sensible system provides said reference sensing attribute as a uniform optical characteristic region corresponding with a first rotor rotational extent.

22. The method of claim 21 in which:

said step for providing a sensible system provides said phase commutating attribute as a second region of rotationally shorter uniform optical characteristic with the same optical path property as said first rotor rotational extent.

23. The method of claim 20 in which:

said step for providing a sensible system provides said phase commutating attribute as a magnetic region corresponding with a second rotor rotational extent and of said first magnetic polarity.

24. The method of claim 23 in which:

said step for providing a sensible system provides said magnetic region corresponding with said first rotor rotational extent as being greater in extent than said second rotor rotational extent.

25. The method of claim 17 further comprising the steps of:

identifying a starting phase for energizing said stator winding to cause said rotor to rotate about said motor axis in a select direction;

commencing the operation of said motor by energizing those said stator windings representing an aligning phase occurring prior to said identified starting phase in said commutation sequence of phases for an alignment interval effective to cause said rotor to rotate toward a stable position within said alignment phase exhibiting substantially zero torque wherein said rotor is oriented to derive rotational torque upon energization of said stator windings of said starting phase; and

de-energizing said stator windings representing said aligning phase and energizing said stator windings representing said starting phase.

26. The method of claim 25 in which:

said step for identifying a starting phase, identifies said starting phase as said reference phase.

27. The method of claim 24 in which:

said step for providing a sensible system provides each said magnetic region in integral relationship with rotor regions of alternating magnetic polarity.

28. A multiphase electric motor comprising:

a stator assembly having a given number of stator poles with windings energizable in a commutational sequence for multiphase operation;

a rotor having a series of regions responsive to energized stator windings to cause rotation of said rotor about a motor axis;

a sensible system rotatable in correspondence with the rotation of said rotor, having phase commutating information defining at least three transitions for each 360° of electrical rotation of said rotor;

a single sensor operatively associated with said sensible system having a sensor output responsive to said sensible system transitions; and

a control circuit responsive to said sensor output to effect energization of said stator assembly windings in correspondence with said commutational sequence.

29. The multiphase electric motor of claim 28 in which:

said sensible system comprises a sequence of regions of magnetic polarity altering from one polarity to an opposite polarity to define given ones of said transitions; and

said single sensor is a Hall effect device.

30. The multiphase electric motor of claim 29 in which:

said rotor regions responsive to energized stator windings are comprised of regions of alternating polarity permanent magnet material; and

wherein said sensible system is formed as an integral part of said rotor permanent magnet material.

31. The multiphase electric motor of claim 30 in which:

said sensible system is located on an axial end of said rotor regions; and

said single sensor has two outputs responsive to said sensible system transitions.

32. The multiphase electric motor of claim 28 in which:

said single sensor is an optical device and said sensible system comprises optical recognition regions readable by said optical device to define transitions in the output of said optical device upon detected changes in said optical recognition regions.

33. The multiphase electric motor of claim 28 in which:

said rotor is positionable with respect to said stator assembly stator poles to provide an orientation defining a motor starting phase;

said control circuit is responsive to a start input to energize those stator poles defining a predetermined alignment phase prior in said commutational sequence to said motor starting phase to effect rotational movement of said rotor toward a stable position of said alignment phase exhibiting substantially zero torque, and is subsequently responsive to de-energize said stator pole windings defining said alignment phase and to effect energization of said stator pole windings defining said motor starting phase.

34. The multiphase electric motor of claim 28 in which:

said sensible system has a reference attribute corresponding with a predetermined reference phase of said predetermined commutational sequence;

said single sensor is responsive to the presence of said reference attribute to derive a said sensor state exhibiting an attribute corresponding therewith;

said control circuit is responsive to said sensor state exhibiting an attribute corresponding with the presence of said reference attribute to effect a mandated excitation of said predetermined reference phase.

35. The multiphase electric motor of claim 28 in which:

said stator assembly stator pole windings are configured for energization in a unipolar fashion;

said single sensor is a Hall effect device having a first output state transition in response to a magnetic polar transition from a first polar sense to a second polar sense of opposite polarity, and having a second output state transition in response to a magnetic polar transition from said second polar sense to said first polar sense;

said sensible system comprises a sequence of magnetic regions alternating from said first polar sense to said second polar sense of opposite polarity to define a first type said state transition occurring at the commencement of each phase in said predetermined commutational sequence of phases, and from said second polar sense to said first polar sense to define a second type said state transition; and

said control circuit is responsive to said first output state transition at said sensor output to effect energization of said stator assembly windings in said predetermined commutational sequence of phases.

36. The multiphase electric motor of claim 28 in which:

said rotor regions and said stator assembly windings are configured to define a starting phase which will yield starting torque in a given rotational direction when said rotor starting phase and stator are aligned in a predetermined relationship;

said control circuit is responsive to a start input to initially energize a predetermined phase or group of phases as an alignment phase prior in a commutational sequence to said starting phase to effect rotational movement of said

rotor toward a magnetically stable position of said alignment phase exhibiting substantially zero torque, and which positions said rotor and said stator in said predetermined relationship, and subsequently is responsive to de-energize said stator pole windings defining said alignment phase and to effect energization of said stator pole windings defining said motor starting phase.

37. The multiphase electric motor of claim 36 in which:

said single sensor is located with respect to said sensible system to be generally centered with respect to a sensible system region of polarity when said rotor is at said magnetically stable position.

38. The multiphase electric motor of claim 36 in which:

said control circuit is non-responsive to said sensor output state transitions during said energization of said stator pole windings defining said alignment phase.

39. The multiphase electric motor of claim 36 in which:

said control circuit is responsive to said start input to initially energize the windings of said alignment phase for a predetermined alignment interval.

40. The multiphase electric motor of claim 35 in which:

said sensible system sequence of magnetic regions define six said transitions for each said 360° of electrical rotation.

41. The multiphase electric motor of claim 28 in which:

said stator assembly stator pole windings are configured for energization in a bipolar fashion;

said single sensor is a Hall effect device having a first output condition in response to a magnetic polar transition from a first polar sense to a second polar sense of opposite polarity, and having a second output condition in response to a magnetic polar transition from said second polar sense to said first polar sense;

said sensible system comprises a sequence of magnetic regions alternating from said first polar sense to said second polar sense of opposite polarity to define a first said transition for a bipolar phase energization and from said second

polar sense to said first polar sense to define a second said transition for a bipolar phase energization; and

said control circuit is responsive to said first and second output conditions at said sensor output to effect bipolar energization of said stator assembly windings in a said commutational sequence of phases representing bipolar energizable paired phases.

42. The multiphase electric motor of claim 41 in which:

said sensible system sequence of magnetic regions define three said first transitions and three said second transitions for each said 360° of electrical rotation.

43. The multiphase electric motor of claim 28 in which:

said stator assembly is configured for three-phase unipolar operation;

said sensible system is comprised of three uniquely different areas of equal length but of generally different magnetic field intensities and polarities; and

said control circuit is responsive to each said uniquely different area to energize a prescribed phase in a commutational sequence of phases.

44. The multiphase electric motor of claim 35 or 41 in which:

said stator assembly is configured for four-phase rotor drive; and

said sensible system sequence of magnetic regions define four said transitions for each said 360° of electrical rotation.

45. A control system for the electrical commutation of a multiphase motor having a rotor and a stator assembly comprising:

a sensible system having sensible information transitions which are equal in number to or greater than the number of said motor phases for each 360° of electrical rotation of said rotor;

a single sensor with at least a single output responsive to said transitions to provide sensor output signals; and

a control circuit configured to process said sensor outputs into sequencial motor phase switching command outputs.

46. The control system of claim 45 in which said single sensor is combined with said control circuit in the form of an integrated circuit.

47. The control system of claim 45 in which said single sensor comprise a single Hall effect device and said sensible system comprises magnetic regions.

48. The control system of claim 46 in which said integrated circuit includes power switching devices which control current flow to said electric phases of said motor.

49. The control system of claim 45 in which said control circuit controls at least three discreet power switching devices that effect current flow in said electrical phases of said motor.

50. The control system of claim 45 in which said sensor and said control circuit are combined within the confines of said motor.

51. The control system of claim 45 in which:

said motor is configured for three-phase operation; and

said sensible system contains six said sensible information transitions in 360° of electrical rotation of said rotor.

52. The control system of claim 45 in which:

said sensible system is configured with six sensible information transitions in 360° of electrical rotation of said rotor; and

said control circuit is configured with six outputs to effect energization of said multiphase motor in a three phase bipolar form.

53. The control system of claim 45 in which:

said motor is configured for four-phase unipolar operation; and

said sensible system contains four said sensible information transitions in 360° of electrical rotation of said rotor.

54. The control system of claim 45 in which:

said motor is configured for two-phase bipolar operation; and

said sensible system contains four said sensible information transitions in 360° of electrical rotation of said rotor.

55. The control system of claim 45 in which:

said single sensor is an optical device; and

said sensible system transitions comprise optically detectable transitions.

56. The control system of claim 45 in which said sensible information transitions comprise alternating areas of magnetic field polarity.

57. The control system of claim 45 in which:

said sensible system sensible information transitions are comprised of the presence of a magnetic field polarity and the substantial non-presence thereof.

58. The control system of claim 45 in which:

said sensible system sensible comprises magnetic regions of two polarities and one of said polarities contains flux intensities of two different levels occurring in 360° of electrical rotation of said rotor.

59. The control system of claim 47 in which:

said single sensor is configured to provide two or more said output signals, each said output signal being derived at a unique magnetic sensitivity level.

60. The control system of claim 59 in which:

said Hall effect device is configured with a single Hall plate in an assembly deriving two or more levels of sensitivity to magnetic field intensities encountered at said sensible system, each said level differing from any other such level by at least about 50 Gauss.

61. The control system of claim 59 in which:

said Hall effect device is configured with two or more Hall plates on a monolithic substrate.

62. The control system of claim 59 in which:

said single sensor is comprised of two or more Hall effect circuits positioned in a single integrated circuit package.

63. A motor commutational control circuit for use with a sensible system having three unique magnetic level regions in 360° of electrical rotation of the rotor of said motor and rotatable in correspondence with the rotation of said rotor to provide multiphase motor performance, said circuit comprising:

a Hall effect sensor based network in a single location responsive to said magnetic level regions to provide information to motor control logic circuitry to effect energization of a predetermined motor phase associated with each of said three unique magnetic level regions, said Hall effect sensor based network being located in a single semiconductor package.

64. A motor commutational control circuit for use with a sensible system having four unique magnetic level regions in 360° of electrical rotation of the rotor of said motor and rotatable in correspondence with the rotation of said rotor to provide four-phase unipolar or two phase bipolar motor performance said circuit comprising:

a Hall effect sensor based network in a single location responsive to said magnetic level regions to provide information to motor control logic circuitry to effect energization of a predetermined motor phase associated with each of said four unique magnetic level regions, said Hall effect sensor based network being located in a single semiconductor package.

65. A Hall effect sensor based motor control circuit, comprising:

a sensing network including a Hall effect device with one or more Hall plates responsive to flux intensity of given levels and polar sense of an encountered magnetic field to provide Hall plate output or outputs corresponding with said flux intensity and polar sense;

an amplification and level detecting network responsive to said Hall plate output or outputs and deriving therefrom two or more differing sensitivity, level detecting network outputs, each said network outputs differing in sensitivity level by about 50 or more Gauss; and

control circuit with logic responsive to said network outputs to provide motor drive output signals for multiphase motor operation.

66. The Hall effect sensor based motor control circuit of claim 65 in which:

said amplification and level detecting network sensitivity levels comprise first operate and release levels responsive in the presence of a first said polar sense and a first said flux intensity to provide a first said network output; and

second operate and release levels at least one of which is responsive in the presence of a second said polar sense and a second said flux intensity to provide a second said network output.

67. A multiphase electric motor, comprising:

a stator assembly having a given number of stator poles with windings configured for said multiphase performance;

a rotor having a sequence of regions responsive to an applied electromagnetically derived field to effect its driven rotation about an axis in operational association with said stator assembly;

a magnet based sensible system rotatable in correspondence with the rotation of said rotor, having at least three regions at least two of which exhibit magnetic intensities of opposite polar sense to define three or more transitions for each 360° of electrical rotation;

a sensor comprising a sensor circuit with an amplification and level detecting network operatively configured with one or more Hall effect plates physically located in one package and having at least a first output and a second output, each responsive to a different unique level of flux intensity when said sensor is under the operational influence of said at least three regions in a succession of first through last, combined said outputs defining during said succession, at least first, second and third logic states; and

a control circuit responsive to said at least first and second sensor outputs to effect energization of said stator assembly windings in a multiphase commutational sequence.

68. The multiphase electric motor of claim 67 in which:

said sensible system comprises three different magnetic region configurations, one of said region configurations exhibiting a first magnetic polar sense at a first magnetic field intensity, a second of said region configurations exhibiting a second polar sense at a second magnetic field intensity, and a third of said region configurations exhibiting no significant magnetic field intensity.

69. The multiphase electric motor of claim 68 in which:

said sensor exhibits operate and release levels both within said first magnetic polar sense to derive a said first output and exhibits operate and release levels both within said second polar sense to derive a said second output.

70. The multiphase electric motor of claim 69 in which:

said control circuit and said stator assembly are configured for carrying out any four step or more commutation sequence including three-phase bipolar or four-phase operation of said motor;

said sensor first output provides a logic identifying a reference phase; and

said sensor second output provides an alternating transition logic for carrying out phase commutation.

71. The multiphase electric motor of claim 69 in which:

said sensible system first polar sense exhibited level of said magnetic field intensity is substantially equal to said second polar sense exhibited level of said magnetic field intensity.

72. The multiphase electric motor of claim 69 in which:

said control circuit and said stator assembly are configured for carrying out any four step or more commutation sequence including three-phase bipolar operation of said motor; and

said sensor first and second outputs logically combine to identify a reference phase and an alternating transition logic for carrying out phase commutation.

73. The multiphase electric motor of claim 69 in which:

said sensible system comprises six said regions within each 360° of electrical rotation;

one of said sensible system region configurations exhibiting said first polar sense at said first magnetic field intensity;

three of said sensible system region configurations exhibiting said second polar sense at said second magnetic field intensity; and

two of said sensible system region configurations exhibiting said no significant magnetic field intensity.

74. The multiphase electric motor of claim 73 in which:

said first magnetic field intensity is substantially equal to said second magnetic field intensity.

75. The multiphase electric motor of claim 73 in which:

said control circuit is responsive to said first sensor output and said region configuration exhibiting said first polar sense for treating it as a reference region, and is responsive to transitions in said second sensor output derived from said sensible system regions to generate said commutational sequence.

76. The multiphase electric motor of claim 69 in which:

said sensible system comprises six said regions within each 360° of electrical rotation;

one of said sensible system region configurations exhibiting said first magnetic polar sense at said first magnetic field intensity;

two of said region configurations exhibiting said second polar sense at said second magnetic field intensity; and

three of said region configurations exhibiting said no significant magnetic field intensity.

77. The multiphase electric motor of claim 76 in which:

said exhibited level of said first magnetic field intensity is substantially equal to said exhibited level of said second magnetic field intensity.

78. The multiphase electric motor of claim 67 in which:

said sensor circuit is responsive to one select said region of said sensible system to define first and second said outputs which mandate to said control circuit the energization of a reference phase.

79. The multiphase electric motor of claim 67 in which:

said sensible system comprises four different magnetic region configurations, a first region configuration exhibiting a first magnetic polar sense at a first magnetic field intensity, a second region configuration exhibiting said first magnetic polar sense at a second magnetic field intensity less than said first magnetic field intensity, a third region configuration exhibiting a second magnetic polar sense at a third magnetic field intensity and a fourth region configuration exhibiting said second magnetic polar sense at a fourth magnetic field intensity greater than said third magnetic field intensity.

said sensor circuit is configured having first, second and third said outputs and when under the operational influence of a succession of said four region configurations, said first, second and third outputs defining four separate distinct combined logic states; and

said control circuit is responsive to said first, said second and a third sensor output to effect energization of said stator assembly windings in a four step commutational sequence.

80. The multiphase electric motor of claim 79 in which:

said first and fourth magnetic region configuration field intensities are of a substantially equal value, and said second and third magnetic region configuration field intensities are of a substantially equal value.

81. The multiphase electric motor of claim 79 in which:

said sensor exhibits operate and release levels both within said first magnetic polar sense and said first magnetic field intensity to derive a said first output, exhibits operate and release levels that are of opposite magnetic polar sense with sensitivities that are within said second and third magnetic field intensities to derive a said second output, and exhibits operate and release levels within said second magnetic polar sense and said fourth magnetic field intensity to derive a said third output.

82. The multiphase electric motor of claim 79 in which:

said sensible system comprises first through fourth said region configurations within each 360° of electrical rotation;

said first region configuration exhibiting said first polar sense at said first magnetic field intensity;

said second region configuration exhibiting said first polar sense at said second magnetic field intensity;

said third region configuration exhibiting said second magnetic polar sense at a said third magnetic field intensity which substantially corresponds with said second magnetic field intensity; and

said fourth region configuration exhibiting said second magnetic polar sense at a said fourth magnetic field intensity which substantially corresponds with said first magnetic field intensity.

83. The multiphase electric motor of claim 69 in which:

said sensible system comprises a succession of first through third said regions within each 360° of electrical rotation;

said first region exhibiting said first polar sense at said first magnetic field intensity;

said second region exhibiting said second polar sense at said second magnetic field intensity; and

said third region exhibiting no significant magnetic field intensity.

84. The multiphase electric motor of claim 83 in which:

said first magnetic field intensity substantially corresponds with said second magnetic field intensity.

85. The multiphase electric motor of claim 69 in which:

said sensible system comprises a succession of first through third said regions within each 360° of electrical rotation;

said first region exhibiting said first polar sense at said first magnetic field intensity;

said second region exhibiting no significant magnetic field intensity; and

said third region exhibiting said second polar sense at said second magnetic field intensity.

86. The multiphase electric motor of claim 85 in which:

said first magnetic field intensity substantially corresponds with said second magnetic field intensity.

87. The multiphase electric motor of claim 67 in which:

said rotor sequence of regions are of permanent magnet derived alternating polarity having a magnetization orientation which is radial with respect to said axis; and

said sensible system regions are combined integrally with said rotor sequence of regions and said at least two of which have a magnetization orientation which is axial with respect to said axis.

88. The multiphase electric motor of claim 87 in which:

one or more of said sensible system regions are provided as a low Gauss region exhibiting no significant magnetic field intensity, as measured by said sensor.

89. The multiphase electric motor of claim 87 in which:

said rotor is configured having a backiron located in adjacency with said sequence of regions having said magnetization orientation which is radial with respect to said axis; and

said backiron not extending into adjacency with said sensible system regions.

90. The multiphase electric motor of claim 67 in which:

said rotor sequence of regions are of permanent magnet derived alternating polarity having a magnetization orientation which is radial with respect to said axis.

said sensible system provides two regions defined by corresponding ones of said rotor sequence of regions and a third said region is defined by the absence of a magnetic material ; and

said sensor is disposed axially with respect to said sensible system region of said rotor sequence of regions.

91. The multiphase electric motor of claim 90 in which:

said rotor is configured having a backiron located in adjacency with said rotor sequence of regions and having an axial length that is fixed and equal in said length to said two regions defined by corresponding ones of said rotor sequence of regions.

92. The multiphase motor of claim 90 in which:

said third region is configured with magnetically soft material.

93. The multiphase electric motor of claim 67 in which:

said sensible system comprises three different magnetic configurations for said regions, a first said region configuration exhibiting a first magnetic polar sense at a first magnetic field intensity, a second said region configuration exhibiting a second polar sense, and a third said region exhibiting said first polar sense at a second magnetic field intensity less than said first magnetic field intensity.

94. The multiphase electric motor of claim 93 in which:

said sensible system first magnetic region configuration exhibits a said first magnetic field intensity which is about three times greater than said third magnetic region field intensity.

95. The multiphase electric motor of claim 93 in which:

said sensible system second magnetic region configuration exhibits said second polar sense at a magnetic field magnitude equal to or greater than said third magnetic field magnitude.

96. The multiphase electric motor of claim 93 in which:

said sensor exhibits operate and release levels both within said first magnetic polar sense to derive a said first output and exhibits operate and release levels that are of opposite magnetic polar sense to derive a said second output.

97. The multiphase electric motor of claim 96 in which:

said control circuit and said stator assembly are configured for carrying out any four step or more commutational sequence including three-phase bipolar or four-phase operation of said motor;

said sensor first output provides a logic identifying a reference phase; and

said sensor second output provides an alternating transition logic for carrying out phase commutation.

98. The multiphase electric motor of claim 97 in which:

said sensor exhibits said first output operate and release levels within a said first magnetic polar sense within said first magnetic field intensity and above said second magnetic field intensity.

99. The multiphase electric motor of claim 96 in which:

said sensible system contains six said regions within 360° of electrical rotation containing three different magnetic configurations;

one region exhibiting said first polar sense at a first magnetic field intensity;

two regions exhibiting said second polar sense; and

three regions exhibiting said first polar sense at a second magnetic field intensity less than said first magnetic field intensity.

100. The multiphase electric motor of claim 96 in which:

said sensible system comprises six said regions within each 360° of electrical rotation containing said three different magnetic configurations;

one region exhibiting said first polar sense at said first magnetic field intensity;

three regions exhibiting said second polar sense; and

two regions exhibiting said first polar sense at said second magnetic field intensity less than said first magnetic field intensity.

101. The multiphase electric motor of claim 100 in which:

said control circuit is responsive to said first output for treating it as a reference region, and is responsive to said second output to derive said commutational sequence.

102. The multiphase electric motor of claim 67 in which:

said motor is configured for three-phase unipolar operation;

said sensible system contains said three different magnetic configurations in 360° of electrical rotation which cause said first and second sensor circuit outputs to generate a unique logic pair for each of said three different magnetic configurations; and

said control circuit is responsive to said first and second sensor circuit outputs to energize each of said phases in said phase commutational sequence as defined by each said unique logic code pair.

103. The multiphase electric motor of claim 102 in which:

said sensible system is configured as a permanent magnet separate from said rotor regions responsive to an applied electromagnetically derived field, said sensible system providing said three different magnetic configurations in 360° of electrical rotation.

104. The multiphase electric motor of claim 103 in which:

said sensible system said three different magnetic configurations are composed of a first sensible region of magnetic intensity of one polar sense, a second sensible region of no significant magnetic field intensity and a third sensible region of magnetic intensity of a second polar sense.

105. The multiphase electric motor of claim 102 in which:

said sensor is positioned at a first location with respect to said sensible system to effect a commutation for said three-phase performance for rotation of said rotor in one directional sense, and positioned at a second location displaced from said first location to effect commutation for said three-phase performance for rotation of said rotor in a directional sense opposite said one directional sense.

106. The multiphase electric motor of claim 67 in which:

said sensible system comprises two different magnetic regions configurations in 120° of electrical rotation and six transitions in 360° of electrical rotation, said region configurations consist of two different magnetic polarities or one magnetic polarity and an absence of any magnetic polarity as detected by said sensor.

107. The multiphase electric motor of claim 106 in which:

said rotor said regions responsive to an applied electromagnetically derived field are comprised of permanent magnet material and said sensible system is integrally formed in one edge of said permanent magnet material.

108. The multiphase electric motor of claim 107 in which:

said rotor said permanent magnet material is configured as a radially magnetized magnet and said sensible system is formed in one axial end of said magnet as notches in each succeeding north or south radially magnetized rotor pole.

109. A control system for an electronically commutated three phase unipolar driven electric motor having a permanent magnet rotor rotatable about a motor axis and a stator assembly configured with stator windings arranged for three phase unipolar operation comprising:

a permanent magnet based sensible system rotatable in correspondence with the rotation of said rotor and having phase commutating information defined by three distinct sensible regions in 360° of electrical rotation;

at least a single magnetic sensing sensor circuit located in a single position with first and second outputs each responsive to different flux levels from said sensible system to define a succession of three distinct combined logic states when under the operational influence of said sensible system; and

a control circuit coupled with said single sensor circuit said first and second outputs to effect an operational sequencing drive to three outputs providing said three phase unipolar driven electric motor operation.

110. The sensor circuit and control circuit of claim 109 which are integrated on a monolithic silicon die.

111. The control system of claim 109 in which:

said sensible system is formed as an integral part of said permanent magnet rotor.

112. The control system of claim 111 in which:

said permanent magnet rotor is radially magnetized and said sensible system with said three distinct sensible regions are each of approximately 120° in electrical length and two of said regions are comprised of the permanent magnet material as radially magnetized and the third region is composed of an absence of said permanent magnet material on an axial end edge of said radially magnetized said permanent magnet.

113. The control system of claim 112 in which:

said sensor is located adjacent to said axial end edge of said permanent magnet and is set to detect the axial flux field or lack of field present at said axial end edge comprising said sensible system.

114. The control system of claim 109 in which:

said sensor said first and second outputs combine to create three distinct digital codes when under the operational influence of said sensible system said three distinct sensible regions in 360° of electrical rotation; and

said three distinct digital codes combine with said control circuit to effect said operational sequencing drive.

115. The control system of claim 109 in which:

said permanent magnet based sensible system is formed of a permanent magnet separate from said permanent magnet rotor and provides said three distinct sensible regions as read by said sensor as a region of magnetic field intensity of one polar sense, a region of no significant magnetic field intensity and a region of magnetic field intensity of a second polar sense.

116. The control system of claim 109 in which:

said permanent magnet based sensible system is formed of a permanent magnet separate from said permanent magnet rotor which provides said three distinct regions as read by said sensor as a first region of magnetic field

intensity of one polar sense, a second region of the same polar sense but of lesser field magnitude by about 1/2 to 1/3 of said first region and a third region of magnetic field intensity of a second polar sense.

117. The motor commutational control circuit of claim 63, in which:

said Hall effect sensor based network and said motor control logic circuitry are combined in a monolithic integrated circuit.

118. The motor commutational control circuit of claim 63, in which:

said Hall effect sensor based network contains two outputs each responsive to a different magnetic polarity.